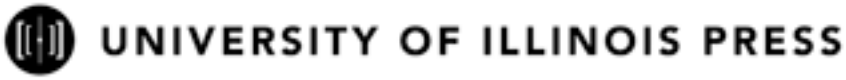

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MODIFICATION BY SUGGESTION OF SOME VESTIBULAR AND VISUAL RESPONSES

By Roy M. Dorcus, Johns Hopkins University

Phenomena such as hysterical anesthesia, anacusia, anopsia, and hypnotically induced phenomena of a similar nature are usually explained by "dissociation" or "functional modification." Such an explanation is useful in so far as it enables us to use common language in our discussions but the acceptance of such explanations lessens the probability of ascertaining what is dissociated or what functional modification really involves. In the experiments which are to be reported, an attempt will be made to show that the generally accepted hypothesis of dissociation needs to be radically modified if it is to be retained as one of the plausible theories.

Since the implications of the dissociation theory will need to be critically evaluated when the results of the experiment are interpreted, further discussion will be deferred until later in the paper. In these experiments, several responses with which most people are unfamiliar have been selected for investigation. The responses of an unfamiliar nature will afford a check on the effects of auto-suggestion which have been recognized as potent factors in dissociation. The responses that have been studied include (1) nystagmus, (2) the falling reaction, (3) pupillary reaction to light, and (4) the production of colored after-images.

(1) Nystagmus. A comparison of the post-rotational eye movements (nystagmus) resulting from actual rotation and suggested rotation under hypnosis was made by means of direct observation and motion pictures. The procedure in this experiment was to (a) rotate the *S* in the Dunlap chair; (b) to observe or photograph the actual nystagmus; (c) to hypnotize the *S* while seated in the chair and give positive suggestions of rotation, turning around, and the experiencing of feelings like those during actual rotation; and (d) to observe or photograph the eye movements.

The *S*s, 4 in number, reported when questioned that they had had a definite illusion of rotation and the feelings accompanying actual rotation. Analysis of the motion-pictures, however, confirmed the observations that the eye movements under hypnosis were of a voluntary type and were unlike the true nystagmic movements following actual rotation. The true nystagmic movement consists of a slow drift phase followed by a quick saccadic phase whereas the voluntary movements were like those accompanying reading or the examination of a series of objects. It should also be pointed out again that every one of the *S*s had actually been rotated before the hypnotic test and consequently had the opportunity of knowing the type of response which occurs following rotation.

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(2) Falling reaction. The *S*s, 6 in number, who were unfamiliar with the technique or the falling reaction that usually occurs following rotation were subjected to the following routine.

Every *S* was first placed in the Dunlap rotator and hypnotized. He was then instructed to keep his eyes closed, to place his elbows on his knees, and to rest his head in the palms of his hands. *E* further suggested that he was going to be rotated; that he would feel himself turning around and around; and that he would have all the feelings that go along with rotation. The motor was actually started to enhance the illusion of rotation, but the clutch was not engaged. After a brief period of continual suggestion of rotation, *S* was told to sit up. None of the 6 *S*s showed any imbalance, or any other sign associated with the falling reaction, although each of them uniformly admitted when questioned, that they had been rotated. Following the above procedure, they were awakened.

S was next rotated and the falling reaction obtained. After this, he was rehypnotized and the procedure outlined above was repeated. The response was secured in every case but it did not conform in direction to the suggested direction of rotation, but the *S*s did not know that clockwise rotation produces falling to the right while counter clockwise rotation produces falling to the opposite side.

(3) Pupillary reaction. The procedure for measuring the pupillary change was not essentially different from that used by other experimenters. *S* before being hypnotized, was seated before *E* facing a 40 watt lamp 18 in. from his eyes. The method of dimming or brightening the lamp by changing a resistance was demonstrated to him. A transparent celluloid strip, scaled in millimeter divisions was held directly before the pupil so that any change could be noted by *E*. Readings were secured with maximal brightness, followed by readings with minimal brightness. *S* was later hypnotized and suggestions of dimming the light were given.

TABLE I

THE DIAMETER OF THE PUPIL (IN MM.) OF NORMAL AND OF HYPNOTIZED *S*s

S	Normal		Hypnotized	
	Bright light	Dim light	Bright light	Suggested dim light
A	3	5	3	3
B	2	4	2	3
C	3	6	3	3
D	3	7	3	3
F	2	7	2	2
G	3	5	3	3

The rheostat was moved in the proper direction for dimming but a short-circuiting switch prevented any actual change. The results (see Table I) of this experiment show that no appreciable effect was produced by the hypnotic suggestion of dimming the light. Every one of 5 *S*s showed an increase in pupillary size when the light was dimmed that ranged from 2--5 mm., whereas not one of the *S*s showed an increase for the suggested dim light.

(4) After-image. Cards 3b, 4a, and 6c of the Wallin set made by Stoelting were employed in the induction of after-images. Every *S* before being hypnotized

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was shown card 3b which contains a blue disk. The yellow after-image is projected on a white background. All of the *S*s gave the usual response of yellow when asked what color they saw, when the after-image was projected. The results of one *S* had to be discarded subsequently since he was red-green color-blind. After the *S*s understood what was required of them, they were hypnotized and the cards 4a and 6c were shown in succession. The card 4a contains a red disk. The after-image green is usually projected on a yellow background which produces a mixture of yellow and green. The *S*s were told, however, that the original red color was green, so that, if the after-image was influenced by the suggested color rather than the physical stimulus, the resulting color would be red-yellow or orange

TABLE II

THE QUALITY OF THE AFTER-IMAGES NORMALLY EXPECTED, HYPNOTICALLY SUGGESTED, AND ACTUALLY RECEIVED

Stimulus-card	S	Response if physical stimuli were effective	Response if suggested stimulus were effective	Response received
	1	yellow-green	yellow-red	greenish-circle
	2	yellow-green	yellow-red	light circle (?)
4a	3	yellow-green	yellow-red	light yellow circle
	4	yellow-green	yellow-red	pale green circle
	5	yellow-green	yellow-red	light green circle
	1	gray	red-blue	white circles
	2	gray	red-blue	light circle
6c	3	gray	red-blue	gray circle
	4	gray	red-blue	gray circle
	5	gray	red-blue	light green (?)

instead of yellow-green. Card 6c contains a blue disk, the after-image of which is normally projected on blue and produces gray. The hypnotic *S*s received suggestions to the effect that the original blue was green. The after-image of the suggested color green when combined with blue would produce a red-blue mixture instead of the usual gray.

The results for 5 *S*s are presented in Table II. It is fairly obvious that the physical stimulus was effective in producing the after-image, since in only two instances were there any doubts. These doubtful responses were caused by the *S*s' inability to properly designate the color.

These experiments have a direct bearing on three of the theories of hypnosis; namely, dissociation as functional modification, narrowing of the field of consciousness, and heightened suggestibility.

The first of these theories assumes that in some way the normal associative tendencies are broken down and that an event or series of events, usually subject to voluntary recall cannot be reinstated in memory except by some special technique or method.

The second theory while postulating some features of the first, involves a restriction of consciousness so that *S* acts only upon the suggestions given and his consciousness is limited to the facts necessary for carrying out such

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suggestion. This theory also necessitates the assumption of restricted initiative.

Increased suggestibility means that *S* will act upon stimulation that would not usually produce a response or at least that the response differs from that which usually occurs. In other words, there is reorganization of the thinking of *S*, so that responses which heretofore have been appropriate, under hypnosis would appear inappropriate if judged by normal criteria. Contrary to the other two theories, increased suggestibility must involve complete integration and complete voluntary control of responses so that the response can be carried out as precisely as possible. For example, amnesia and anesthesia even when apparently present may be pseudo-experiences not comparable to these experiences in normal *S*s.

In regard to the first experiment it may be assumed that all individuals have experienced eye movements during linear or rotational movement. Therefore, we might assume a priori that these individuals would make eye movements when they believe they are rotated. Normal associative processes including memory are involved in complying with the instructions under hypnosis. We can also assume that most people have not analyzed critically the reflex type of movement following rotation and since the movements are involuntary, only simulation of the movements occurs. The results support these assumptions. In Experiment 2, the falling reaction is likewise new to the individual. If there were some direct stimulation of the vestibular function through suggestion we might expect the reaction to take place, even though it has not been previously experienced, since it is an almost invariable reflex. In none of the *S*s could the falling reaction be invoked under hypnosis, until after they had actually experienced the reaction. This again indicates rationalization and the use of normal associative functions.

The pupillary response used in Experiment 3 while not usually subject to voluntary control can be conditioned, and one might safely predict that in conditioned *S*s the pupil would definitely expand with a suggested decrease in illumination. This will not usually happen under hypnosis because the neural function necessary for the production of the phenomena has not been properly organized.

From the point of view of the theoretical implications, perhaps the most interesting experiment of the group is the after-image experiment. If a hypnotized *S* knows the principle underlying after-images, the after-image will always be that of the suggested color. For example, if a hypnotized person knows that the after-image of red is green and that the after-image of blue is yellow, he will report that he sees a yellow after-

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image if he is shown a red color and told that it is blue. Wallin's after-image cards are of a sufficiently complex nature to prevent the unversed individual from knowing the correct answer immediately. They are useful, therefore, as a means of ascertaining the effect of suggestion and the effect of the physical stimulus. If *S*s under hypnosis almost invariably give the logically correct answer for the suggestion, when they know what the answer should be and give an answer compatible with the physical conditions when they do not know the correct answer, we have to infer that there is a remarkably high degree of integration taking place. At least, we can safely say that hypnotic suggestion does not modify the mechanism involved in color vision.

All of the experiments point toward a high degree of integration during hypnosis, since *S* has to call upon previous memories to provoke the correct response. It is only in those cases where the response is unknown that *S* tends to go wrong. If dissociation is so highly selective as would be demanded for explaining this type of activity it is not useful as an explanatory concept. It would be invalidated because of the time factors involved. At one instant, a fact of memory would be dissociated yet in the succeeding instant it is utilized in making a response. No special technique has been employed here for restoring the fact to memory.

A narrowed field of consciousness induced by the attitudes of the *S* himself and the technique of hypnosis involves auto-suggestion. The restriction of consciousness is supposed to develop to such an extent that *S* will have no conflicting impulses and only the acceptance reaction. This in turn implies that the volition of *S* is reduced to practically zero. Unfortunately, most hypnotic *S*s manifest a high degree of volitional activity in carrying out suggestions. It would be safer to say that volitional activity is restricted to such stimulation as is given by *E*. This statement would then be in accordance with auto-suggestion established in the manner outlined previously.

All of the experiments which have been carried out in this investigation indicate that the reactions are the results of volitional activity. That is, once the reaction is known to *S* he proceeds to act on the suggestion of the hypnotist. There is no special functional modification in so far as these experiments show. Nystagmus is simulated; falling, following suggested rotation occurs, provided *S* has actually been rotated previously; pupillary expansion does not take place except under actual changes in illumination; and color responses are not modified except in the verbal reports of the hypnotized *S* who is familiar with the phenomena of after-images. All of these responses agree with *S*'s ideas as to what *E* expects. They

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appear to have all the elements of active reasoning in which the entire past experience is utilized. When *S* does not know what the response should be, he is unable to make it. For example, in the hypnotic falling reaction after actually experiencing falling, the direction of falling is not always appropriate to the suggested direction of rotation. *S* does not know the relation between direction of falling and direction of rotation.

It seems to the writer that the major difference between a reaction under hypnosis and a normal reaction is the difference between the verbalization of what happened and the actual event. This difference can be explained on a basis of heightened suggestibility, and not by a theory of dissociation or restriction of consciousness.

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